

965,858



PATENT SPECIFICATION

NO DRAWINGS

965,858

Date of Application and filing Complete Specification: May 15, 1962.

No. 18557/62.

Application made in United States of America (No. 112,209) on May 24, 1961.

Application made in United States of America (No. 136,744) on Sept. 8, 1961.

Complete Specification Published: Aug. 6, 1964.

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COMPLETE SPECIFICATION

Organic Solvent Compositions and their use

CORRECTION OF CLERICAL ERRORS

SPECIFICATION NO. 965,858

The following correction is in accordance with the Decision of the Superintending Examiner, acting for the Comptroller-General, dated the 30th day of November, 1964.

Page 3, line 76, for "chloroethane" read "chloroethylene"

Page 3, line 119, for "depending upon how frequently" read "it should be considered how frequent"

Page 3, lines 120 and 121, after "conveniently" insert full stop delete "should be considered"

Page 4, line 119, for "include" read "including"

Page 6, line 14, for "as given" read "are given"

Attention is also directed to the following printer's errors:—

Page 2, line 18, for "Metal" read "Metals"

Page 2, line 58, for "one" read "on"

THE PATENT OFFICE,
4th February, 1965

D 34102/6

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Organic Solvent Compositions and their use

We, PITTSBURGH PLATE GLASS COMPANY, a Corporation organised under the laws of the State of Pennsylvania, United States of America, of One Gateway Center, Pittsburgh, Pennsylvania, United States of America, (Assignee of CHARLES LLOYD CORMANY and EDWARD ERDMAN EBEL, Jr.), do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns organic solvent cleaning fluids and their use, particularly in the degreasing of metals.

U.S. Patent Specification No. 2,070,962 describes a constant boiling liquid solvent composition having a flash point of 84.2°C., consisting substantially of 60 parts by volume ethylene dichloride (1,2-dichloroethane) and 40 parts by volume trichloroethylene. This composition purportedly behaves as a unitary substance while combining the advantages of its individual components.

According to the present invention, there is provided a chlorinated aliphatic hydrocarbon solvent composition comprising trichloroethylene and 1,2-dichloroethane in the

volume ratio of from 1.5 to 9 parts trichloroethylene per part of 1,2-dichloroethane.

In accordance with the present invention, valuable solvent compositions affording a variety of benefits are provided by compositions of trichloroethylene having as a vital second component carefully regulated concentrations of 1,2-dichloroethane. The compositions of the present invention contain from 1.5 to 9 parts trichloroethylene per part of 1,2-dichloroethane by volume. Thus, 1,2-dichloroethane concentrations range from 10 to 40 per cent, preferably from 15 to 35 per cent, by volume based on the trichloroethylene and 1,2-dichloroethane.

Certain characteristics of the compositions of the present invention have been observed. Thus, tests indicate their solvent properties as manifested by Kauri Butanol values exceed those of either trichloroethylene or 1,2-dichloroethane. This, despite the fact that the Kauri Butanol value of 1,2-dichloroethane is considerably below that of trichloroethylene.

In the following Table I, Kauri Butanol values obtained in accordance with the ASTM procedure D—1133—54T, using the toluol standardization, are given:

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TABLE I

Composition Per Cent by Volume		Kauri Butanol Value
Trichloroethylene	1,2-Dichloroethane	
100	0	132.7
90	10	136.0
80	20	137.7
70	30	139.2
60	40	138.2
50	50	131.3
40	60	122.2
30	70	115.4
20	80	107.1
10	90	96.7
0	100	90.3

The compositions of the present invention will serve effectively as cleaning compositions for such purposes as dry cleaning of fabrics and degreasing (liquid and/or vapour phase) of metallic articles. They are significantly free of substantial fire hazard, having no fire or flash point as determined by standard testing procedures. Significantly, in vapour phase degreasing of metallic objects, these solvent compositions do not give rise to fire hazards. Notwithstanding that 1,2-dichloroethane normally boils below trichloroethylene, repeated volatilization and condensation of the liquid composition during vapour phase degreasing does not encounter liquid or vapour compositions which present serious fire hazards.

Metal such as iron and aluminium are effectively degreased utilizing a vaporous mixture of 1,2-dichloroethane and trichloroethylene in the proportions according to the present invention.

In vapour degreasing, a liquid body of degreasing solvent is provided. Through heating, solvent from this liquid body is vaporized, providing a vaporous atmosphere rich in solvent vapours. Articles to be vapour degreased are introduced into this atmosphere rich in solvent vapours. Solvent vapours are caused to condense upon the article, usually a metal article, and greases, oils, dirt or grime present on the exposed surfaces of the article are removed.

This condensate drips from the article and is generally directly or indirectly utilized further. It may simply be returned directly to the liquid solvent body. In better practices, condensate is purified prior to its return, regardless of the liquid body (there may be several in the more complex vapour degreasers) to which it eventually returns.

Nevertheless, most vapour degreasings experience solvent losses during the course of operations which often extend for considerable periods of time. Solvent vapours, for example, are lost to the atmosphere. In more complex degreasing devices, solvent losses may occur in the purification procedures. When using as the degreasing solvent a mixture of 1,2-dichloroethane and trichloroethylene containing from 10 to 40 per cent by volume 1,2-dichloroethane, 1,2-dichloroethane losses are proportionately greater than those of trichloroethylene.

A liquid body of 1,2-dichloroethane and trichloroethylene containing from 10 to 40 per cent 1,2-dichloroethane by volume (based on the trichloroethylene and 1,2-dichloroethane) can be utilized effectively in vapour degreasing of articles, especially metallic articles. This entails evolving from the liquid body of degreasing solvent (e.g. a boiling sump) an atmosphere of 1,2-dichloroethane and trichloroethylene vapours into which articles to be degreased are presented. Vapours

of degreasing solvent are condensed upon the articles. Condensate containing greases and oils removed from the article are returned usually to the liquid body of solvent compositions.

Control of the 1,2-dichloroethane concentration in the vapours to which the articles are presented for degreasing is important. A volume of about 45 per cent 1,2-dichloroethane by volume (basis the 1,2-dichloroethane and trichloroethylene) in the vapours is preferred. Moreover, at least 10 per cent by volume, and preferably at least 20 to 30 per cent by volume, of the solvent vapours (trichloroethylene and 1,2-dichloroethane) should be 1,2-dichloroethane.

To maintain a vapour degreasing environment containing 1,2-dichloroethane in this proportion with respect to trichloroethylene, the composition of the liquid solvent body is regulated. This is accomplished by adding 1,2-dichloroethane to the liquid body (boiling sump) usually while the degreaser is in operation. Depending upon the operating characteristics of a particular vapour degreaser, including by way of illustration the rate of vapour losses through for example leakage, the amount, frequency and rate of 1,2-dichloroethane addition to the liquid body obviously varies.

In typical performance of a degreasing operation using the compositions of the present invention, a liquid body of degreasing solvent of 1,2-dichloroethane and trichloroethylene containing from 10 to 40 per cent, preferably from 15 to 35 per cent, by volume based on the combined volume of the two solvents is established initially in the degreaser. The degreaser is then placed in operation. Heat is applied to the liquid body to raise it to a temperature at which it evolves vapours of both 1,2-dichloroethane and trichloroethylene, thereby establishing a vapour degreasing environment and articles to be degreased are contacted with the environment rich in solvent vapours, usually by simply introducing the articles into the vapours of solvent. Solvent vapours condense upon the articles, and drippings which return to the liquid body are in effect repeatedly revolatilized, degreasers often being operated utilizing an initial charge of solvent for extended periods of, for example, thirty days or even more.

In the course of continuous operation of a degreaser in the foregoing fashion, the liquid body from which solvent vapours are evolved (usually termed a boiling sump) becomes depleted in 1,2-dichloroethane by comparison with trichloroethylene. This affects the composition of degreasing vapours which becomes weaker in 1,2-dichloroethane.

To assure adequate 1,2-dichloroethane vapours in the atmosphere of the degreasing vapours, the 1,2-dichloroethane concentration in the liquid body (from which the degreas-

ing vapours are evolved) is regulated from 10 to 40 per cent by volume (based on the dichloroethane and trichloroethylene) by adding as required 1,2-dichloroethane. Preferably, 1,2-dichloroethane is added when the 1,2-dichloroethane concentration drops below 20 per cent by volume (usually the 1,2-dichloroethane concentration by volume in the liquid body is in the range of 12 to 20 per cent by volume based on the dichloroethane and trichloroethane content of the liquid body) in the liquid body.

Considerable caution is recommended in this addition of 1,2-dichloroethane, lest too great a concentration develops in the liquid body. Thus, 1,2-dichloroethane concentrations in the liquid body substantially in excess of 40 per cent by volume (based on the 1,2-dichloroethane and trichloroethylene) are avoided, particularly to circumvent serious fire hazards, especially in the vapour degreasing atmosphere.

In a preferred embodiment hereof, the liquid body is replenished with 1,2-dichloroethane by addition thereof as a mixture of 1,2-dichloroethane and trichloroethylene.

Better practices involve, after operation of a vapour degreaser has reached static or equilibrium conditions, controlling the liquid body or boiling sump so as to provide for a 1,2-dichloroethane content of from 10 to 30 per cent (preferably 15 to 25 per cent) by volume (based on the 1,2-dichloroethane and trichloroethylene) through the addition of a liquid mixture of 1,2-dichloroethane and trichloroethylene, the 1,2-dichloroethane concentrations of which are greater than that to be maintained in the liquid body and greater than the prevailing 1,2-dichloroethane concentration in the liquid body. A liquid mixture containing from 28 to 35 per cent by volume 1,2-dichloroethane (based on 1,2-dichloroethane and trichloroethylene) is excellent for this purpose.

Enough additional liquid degreasing solvent should be added to raise the 1,2-dichloroethane concentration by about an increment of 2 to 15 per cent by volume. That is, if the 1,2-dichloroethane content of the liquid body is 12 per cent by volume, make-up when added periodically advisedly should raise the 1,2-dichloroethane content to a concentration of the order of 14 to 29 per cent by volume. Of course, depending upon how frequently make-up may be added conveniently should be considered. If frequent make-up is tolerable, smaller change in composition of the liquid solvent body offers more uniform conditions of operation.

In using the compositions of the present invention in commercial solvent cleaning such as in degreasing of metallic articles, it is advisable to stabilize them against undue and premature decomposition or degradation. Depending upon the particular conditions to

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which the compositions are subjected, the nature and extent of stabilization may be varied. In degreasing of metallic articles such as aluminium, so alarmingly rapid is decomposition without adequate stabilization that stabilization as a practical matter is required. In dry cleaning, however, decomposition is not usually so rapid.

Articles vapour degreased are most frequently metallic. Fine metal turnings, cutting, lubricating and turning oils, greases, grit and the like adhering to the metal articles are removed by the degreasing. Metallic articles of iron, copper and aluminium or alloys thereof, are subjected to vapour degreasing.

Decomposition of solvent degreasing compositions during usage, especially when degreasing metals such as aluminium, can be quite serious. Unless adequately stabilized, solvents of 1,2-dichloroethane and trichloroethylene during such degreasing operations can decompose to a detrimental extent, often within a period of time much too short to be economical. Moreover, decomposition can often occur to an extent that necessitates halting use of the degreaser for tedious and expensive cleanings.

Sound practices involve stabilizing against such decompositions by including in these compositions one or more additives which alone or in co-operation enhance stability. Obviously, the compositions may be stabilized taking into account only the decomposing conditions to be encountered in their destined use. More frequently, liquid cleaning solvent compositions within the scope of the present invention are stabilized so that they are multipurpose cleaning materials, e.g. useful for most if not all of the major cleaning applications.

Quite a variety of materials may be incorporated, usually in but minor concentrations in these compositions for the purpose of serving as deterrents to decomposition. Most stabilizing additives are incorporated in amounts ranging upwards of 0.005 per cent by weight of the chlorinated aliphatic hydrocarbons (trichloroethylene and 1,2-dichloroethane). Rarely does the concentration of an individual stabilizing additive exceed 3 or even 2 per cent by weight of the composition because of the considerable expense attendant to the use of much larger quantities of stabilizer among other things.

Effective practical stabilization of the solvent compositions frequently involves protecting the composition against a multiplicity of decomposition inducing conditions. For example, during the course of operation with a single charge of degreasing solvent, a degreaser may be used to clean articles made of various metals. Sound practices dictate stabilizing the degreasing composition against decomposition which may be initiated by any and all such metals. Often a multiplicity of

additives are, accordingly, incorporated in the degreasing composition, each being present in concentrations of at least 0.001 per cent and usually up to 2 per cent by weight. Only rarely does the concentration of all the stabilizing additives (when a plurality are employed) exceed 5 per cent by weight of the composition, and usually the total stabilizing additive concentration is in the range of 0.5 to 3 per cent by weight.

Many compounds deter decomposition of the compositions of the present invention. Among such stabilizers are amines such as diethylamine, triethylamine, dipropylamine, tripropylamine, triisopropylamine, dibutylamine, diisobutylamine, diamylamine, diethanolamine, triethanolamine, methylmorpholine, morpholine, pyridine, pyrrole, *n*-methylpyrrole, *n*-ethylpyrrole, pyrrolidine and pyrroline.

Organic epoxides (oxiranes) such as ethylene oxide, 1,2-propylene oxide, 1,2-butylene oxide, 2,3-butylene oxide, butadiene monoxide, butadiene dioxide, epichlorohydrin, glycidol, isobutylene oxide, 1,2-octylene oxide, 2,3-octylene oxide, 2,3-diisobutylene oxide, styrene oxide, cyclohexene oxide and cyclopentene oxide also have a deterring effect upon decomposition. Glycidol, among all these epoxides, is especially effective.

Phenols including phenol itself, thymol, catechol, para-cresol, guaiacol and other aromatic compounds containing a phenolic hydroxy group directly attached to a ring carbon such as methyl salicylate which have normal boiling points between 180°C. and 250°C. may be advantageously incorporated for stabilizing purposes. Still other additives function to stabilize these degreasing compositions, including reaction products of ketones or aldehydes with hydrazines or dialkylhydrazines. Ketone hydrazones such as acetone hydrazone, acetone dimethylhydrazone, and like ketone hydrazones, especially those containing no more than 6 carbon atoms (and preferably no radical having more than 3 carbon atoms) may be successfully employed. Aldehyde hydrazones illustrated by chloral dimethylhydrazone, acetaldehyde hydrazone, acetaldehyde dimethylhydrazone and like aliphatic aldehyde hydrazones containing up to 6 carbon atoms also impart effective stabilizing action.

Other compounds include esters of organic monocarboxylic acids such as ethyl acetate, butyl acetate, ethyl propionate and the like are of benefit. Similarly, alcohols, especially unsaturated alcohols such as propargyl alcohol, offer stabilizing benefits, as do saturated monohydric alcohols such as isopropanol, *t*-butanol, secondary butanol, isobutanol, amyl alcohol and normal propanol.

Dioxanes such as 1,4-dioxane; nitroalkanes such as nitromethane, nitroethane and nitropropane; tetrahydrofuran; tetrahydrothio-

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phene; nitriles, especially aliphatic nitriles including acrylonitrile and acetonitrile; ethers such as dialkoxyethanes illustrated by dimethoxyethane; may be included in the degreasing composition for stabilization purposes, especially to deter aluminium or aluminium alloy induced decomposition.

Other additives include weak acid salts of amines of the type described in British Patent Specification No. 891,242.

The present invention may be illustrated by, but is in no manner limited to, the following examples.

EXAMPLE 1

A stabilized liquid cleaning solution of 67 parts by volume trichloroethylene and 33 parts by volume 1,2-dichloroethane was prepared by first mixing in proper ratios the respective aliphatic chlorinated hydrocarbons at a temperature of about 25°C. Ideally, the trichloroethylene and 1,2-dichloroethane are of highest purity, although effective degreasing compositions are provided by mixing commercially available trichloroethylene and 1,2-dichloroethane. To this solution the stabilizing compounds as shown in Table II below were added in the specified concentration:

TABLE II

Additive	Weight Per Cent (Basis the Solution)
acetaldehyde dimethylhydrazone	0.025
butylene oxide	0.28
glycidol	0.06
thymol	0.025
n-propanol	0.25

The liquid solvent composition of trichloroethylene and 1,2-dichloroethane is thus stabilized to an extent that it may be effectively used without encountering serious decomposition in the vapour phase degreasing of metallic articles such as iron and steel or other iron containing alloys.

Besides degreasing compositions having approximately 2 parts trichloroethylene per part of 1,2-dichloroethane by volume, other compositions of these two components containing from 1.5 to 9 parts by volume trichloroethylene per part by volume 1,2-dichloroethane may be employed in the practice of the present invention and effectively stabilized in accordance with the afore-described principles. The useful degreasing compositions are homogeneous mixtures of the two principal chlorinated aliphatic hydrocarbons and, as a rule, have a pH in excess of 5 but usually less than 11. When substantially free of foreign acidic materials, a preferable condition, and properly stabilized, these degreasing solvents rarely, if ever, exhibit any substantial degree of acidity, e.g. a highly acidic pH, usually the pH is, accordingly, 5 or greater. When one or more of the additives are rather strongly alkaline, such as is the case with certain amines in the stabilizer, the pH of the stabilized solution is apt to be between 9 and 11.

EXAMPLE 2

A degreaser having an operating liquid solvent (or sump) capacity of 10 litres is charged with 10 litres of liquid degreasing solvent solution as described in Example 1. Approximately 2 litres of aluminium alloy chips are added to the liquid solvent along with 1.5 litres of Limax 78 (a lubricating oil), 0.6 litre Houghton 3105 (a drawing lubricant) and 0.25 litre of Shell 13-K. These additives simulate conditions prevailing in large scale metal degreasing operations.

This degreasing unit is provided with cooling coils surrounding the vapour degreasing space. In operation, the vapours rise from a body of boiling degreasing solvent, condense in the vapour degreasing atmosphere and are collected, forwarded to a water phase separator and the solvent phase forwarded to a condensate tank. From this tank, solvent is recirculated to the liquid sump.

Once charged, the liquid body of degreasing solvent is raised by electrical heating element to a temperature of between 80°C. and 110°C., usually the initial temperature being 83°C. Trays of metal articles to be degreased as desired may then be presented to the vapour degreasing atmosphere in the degreaser for degreasing. The degreaser is operated continuously in this fashion.

During an extended period of operation, the

5 sump and condensate tank contents are sampled and analyzed for 1,2-dichloroethane and trichloroethylene. The analysis of the condensate tank content indicates the 1,2-dichloroethane-trichloroethylene ratio in the vapour degreasing atmosphere. Periodically, usually at least every several days, some 1 to 2 litres of a 1,2-dichloroethane-trichloroethylene liquid mixture (33 per cent 1,2-dichloroethane by volume) is added. 10

Typical analyses of samples from the sump (liquid solvent body) and condensate tank, indicating the prevailing compositions thereof during performance of the degreasing as given in Table III below: 15

TABLE III

Hours of Operation Cumulative	Sump Composition (Per Cent by Volume)		Condensate Tank Composition (Per Cent by Volume)	
	EDC ⁽¹⁾	Tri ⁽²⁾	EDC ⁽¹⁾	Tri ⁽²⁾
83	26.2	73.8	32.2	67.8
101	25.8	74.2	31.5	68.5
165	19.0	81.0	23.6	76.4
+209	21.6	78.2	28.7	71.3
260	21.4	78.6	28.1	71.9
310	18.8	81.2	25.8	74.2
+312	24.5	75.5	29.9	70.1
330	23.7	76.3	29.9	70.1
354	22.6	77.4	29.0	71.0

+ Samples taken after addition of about 1.5 litres of liquid 1,2-dichloroethane-trichloroethylene mixture containing 33 per cent by volume 1,2-dichloroethane.

⁽¹⁾ EDC denotes 1,2-dichloroethane.

⁽²⁾ Tri denotes trichloroethylene.

20 As cutting oils, metallic chips and the like accumulate in the liquid degreasing solvent body within the degreaser, the temperature of the sump rises. Thus, the liquid sump temperature increases, usually from 82°C. upward to about 95°C. or 98°C.

WHAT WE CLAIM IS:—

25 1. A chlorinated aliphatic hydrocarbon solvent composition comprising trichloroethylene and 1,2-dichloroethane in the volume ratio of from 1.5 to 9 parts trichloroethylene per part of 1,2-dichloroethane.

30 2. A composition as claimed in claim 1 in which there is from 15 to 35% by volume of the 1,2-dichloroethane, based on the trichloroethylene and 1,2-dichloroethane.

35 3. A composition as claimed in claim 1 or 2 which also contains at least one stabilizer.

4. A composition as claimed in claim 3 in which the stabilizer is present in an amount

greater than 0.005% by weight based on the trichloroethylene and 1,2-dichloroethane.

5. A composition as claimed in claim 3 or 4 in which the stabilizer is present in an amount of less than 3% by weight based on the trichloroethylene and 1,2-dichloroethane. 40

6. A composition as claimed in claim 5 in which the stabilizer is present in an amount of less than 2% by weight based on the trichloroethylene and 1,2-dichloroethane. 45

7. A composition as claimed in claim 3 in which a multiplicity of stabilizers is used, each stabilizer being present in an amount of 0.001 to 2% by weight based on the trichloroethylene and 1,2-dichloroethane. 50

8. A composition as claimed in claim 7 in which the total amount of stabilizers is less than 5% by weight based on the trichloroethylene and 1,2-dichloroethane. 55

9. A composition as claimed in claim 8 in

which the total amount of stabilizers is 0.5 to 3% by weight based on the trichloroethylene and 1,2-dichloroethane.

5 10. A composition as claimed in any of claims 3 to 9 in which the stabilizer is an amine, epoxide, phenol or reaction product of a ketone or aldehyde with a hydrazine or dialkylhydrazine.

10 11. A composition as claimed in any of claims 3 to 9 in which the stabilizer is a dioxane, nitrile or ether.

15 12. A chlorinated aliphatic hydrocarbon solvent composition according to claim 1 as hereinbefore described with particular reference to Example 1.

20 13. A method of vapour degreasing which comprises vaporizing trichloroethylene and 1,2-dichloroethane from a liquid body comprising 10 to 40% by volume of 1,2-dichloroethane, based on the trichloroethylene and 1,2-dichloroethane, thereby providing a degreasing vapour atmosphere and degreasing articles in this degreasing vapour atmosphere.

25 14. A method as claimed in claim 13 which comprises continuing to provide the degreasing vapour atmosphere, the 1,2-dichloroethane concentration in the liquid body being depleted and then 1,2-dichloroethane added to increase the 1,2-dichloroethane in the liquid body to a concentration from 10 to 40% by volume based on the trichloroethylene and 1,2-dichloroethane.

30 15. A method as claimed in claim 13 or 14 in which the liquid body comprises 20 to 40% by volume of 1,2-dichloroethane based on the trichloroethylene and 1,2-dichloroethane.

35 16. A method as claimed in any of claims 13 to 15 in which a mixture of trichloroethylene and 1,2-dichloroethane having a 1,2-dichloroethane concentration greater than that prevailing in the liquid body is added thereto to increase the 1,2-dichloroethane concentration in the liquid body.

40 17. A method as claimed in any of claims 13, 14 or 16, in which the liquid body comprises 28 to 35% by volume of 1,2-dichloroethane, based on trichloroethylene and 1,2-dichloroethane.

50 18. A method as claimed in claim 16 or 17

in which said mixture comprises 2 parts of trichloroethylene per part of 1,2-dichloroethane, by volume.

19. A method as claimed in any of claims 13 to 18 in which the liquid body also contains at least one stabilizer. 55

20. A method as claimed in claim 19 in which the stabilizer is present in an amount greater than 0.005% by weight based on the trichloroethylene and 1,2-dichloroethane. 60

21. A method as claimed in claim 19 or 20 in which the stabilizer is present in an amount of less than 3% by weight based on the trichloroethylene and 1,2-dichloroethane.

22. A method as claimed in claim 21 in which the stabilizer is present in an amount of less than 2% by weight based on the trichloroethylene and 1,2-dichloroethane. 65

23. A method as claimed in claim 19 in which a multiplicity of stabilizers is used, each stabilizer being present in an amount of 0.001 to 2% by weight based on the trichloroethylene and 1,2-dichloroethane. 70

24. A method as claimed in claim 23 in which the total amount of stabilizers is less than 5% by weight based on the trichloroethylene and 1,2-dichloroethane. 75

25. A method as claimed in claim 24 in which the total amount of stabilizers is 0.5 to 3% by weight based on the trichloroethylene and 1,2-dichloroethane. 80

26. A method as claimed in any of claims 19 to 25 in which the stabilizer is an amine, epoxide, phenol or reaction product of a ketone or aldehyde with a hydrazine or dialkylhydrazine. 85

27. A method as claimed in any of claims 19 to 25 in which the stabilizer is a dioxane, nitrile or ether.

28. A method of vapour degreasing substantially as hereinbefore described with particular reference to Example 2. 90

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Reference has been directed in pursuance of Section 9, subsection (1) of the Patents Act, 1949, to Patent No. 896,953.

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